Engineering Specification Report

Plant Design Document Analysis

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ENGINEERING SPECIFICATION ANALYSIS

Focus Area: Entire Document

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1. Purpose and Scope of Documents:

• Governs Nozzle Load Analysis for tank shell openings and requirements for shell-mounted nozzle design (From "new_test - Copy - Copy.pdf", Engineering Specification Analysis, Focus Area: Nozzle Load Analysis).

• API 650 is specified as the primary tank design code to be followed for the project (From "new_test - Copy - Copy.pdf", Engineering Specification Analysis, Accepted Specifications).

• Vendor deliverable requirement: "Nozzle load Analysis" is a required submission item during Manufacturing & site erection (From "new_test - Copy - Copy.pdf", Accepted Specifications; Vendor Data Requirements, 10080-1-SS-ME-004, 12.2.viii).

• Applicability to manufacturing and site erection phases is explicitly stated for the vendor deliverable (From "new_test - Copy - Copy.pdf", Accepted Specifications; Vendor Data Requirements, 10080-1-SS-ME-004, 12.2.viii).

- CONTRACTOR responsibility: CONTRACTOR to confirm acceptability of specified external nozzle and support pad loading or advise maximum acceptable loading for the tank design (From "new_test - Copy - Copy.pdf", Statement of responsibility / acceptance criteria; 10080-1-SS-ME-004, Appendix P, P.1.1).

2. Applicable Codes, Standards, and References:

• "API 650 Appendix P" (explicitly referenced as mandatory for Allowable External Loads on Tank Shell Openings) (From "new_test - Copy - Copy.pdf", Accepted Specifications; 10080-1-SS-ME-004, Appendix P).

• "API 650" (general) (From "new_test - Copy - Copy.pdf", Accepted Specifications; Specification 10080-1-SS-ME-004).

• "IS 875 (Part 3)" (wind design standard) (From "new_test - Copy - Copy.pdf", Project-level structural/environmental load standards; BEDD EPCMD-1-DBD-GE-001, section 5.2.2 addition).

• "IS 1893" (seismic design standard) (From "new_test - Copy - Copy.pdf", Project-level structural/environmental load standards; BEDD and 10080-1-SS-ME-004 Appendix E).

• "IITK-GSDMA guidance" (referenced for seismic/tanks Appendix E) (From "new_test - Copy - Copy.pdf", Project-level structural/environmental load standards; 10080-1-SS-ME-004 Appendix E).

• Software list: "CAESAR, NOZZLEPRO, CAEPIPE" as accepted tools for piping stress / nozzle analysis (From "new_test - Copy - Copy.pdf", Software specified for piping stress / nozzle analysis; BEDD EPCMD-1-DBD-GE-001, section 5.2).

• Project document references: "10080-1-SS-ME-004" (multiple references including Appendices) (From "new_test - Copy - Copy.pdf", Accepted Specifications and multiple entries).

• Project document reference: "BEDD EPCMD-1-DBD-GE-001" (From "new_test - Copy - Copy.pdf", Project-level structural/environmental load standards and software list).

3. Design and Performance Requirements:

- Use API 650 Appendix P nozzle-load table values as minimum requirements for shell-mounted nozzle design (From "new_test - Copy - Copy.pdf", Accepted Specifications; 10080-1-SS-ME-004, Appendix P).

• API 650 Appendix P is mandatory for allowable external loads on tank shell openings (From "new_test - Copy - Copy.pdf", Accepted Specifications; 10080-1-SS-ME-004, Appendix P - "This appendix is mandatory...").

• For nozzles ≤ 2": loads considered negligible (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; Note in doc).

• For nozzles > 24": allowable loads to be agreed between CONTRACTOR and CONSTRUCTION MANAGER (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; Note in doc).

• Wind design parameters: site wind speed = 50 m/s, terrain category 2, Group B, K1=1.08, K2=1.1, K3=1.0, shape factor = 0.7 (From "new_test - Copy - Copy.pdf", Project-level structural/environmental load standards; BEDD EPCMD-1-DBD-GE-001, section 5.2.2 addition).

• Seismic design per IS 1893; tanks Appendix E requires IS 1893 / IITK-GSDMA guidance (From "new_test - Copy - Copy.pdf", Project-level structural/environmental load standards; BEDD and 10080-1-SS-ME-004 Appendix E).

• Units and conventions: Force = N; Moment = Nm; Loading (linear) = kN/m; Loading (surface) = kN/m2; Pressure units = kg/cm2 g (From "new_test - Copy - Copy.pdf", Units and conventions; BEDD Section 6 Units).

- CONTRACTOR to confirm acceptability of specified external nozzle and support pad loading or advise maximum acceptable loading for the tank design (From "new_test - Copy - Copy.pdf", Statement of responsibility / acceptance criteria; 10080-1-SS-ME-004, Appendix P, P.1.1).

4. Material and Component Specifications:

• None found explicitly in the provided documents.

5. Loads, Allowables, and Design Data:

• Nozzle allowable loads (apply at nozzle-to-shell junction) per API 650 Appendix P (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P):

• Nozzle size 3": Radial load 1000 N; Circumferential moment 200 Nm; Longitudinal moment 200 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 4": Radial load 1500 N; Circumferential moment 300 Nm; Longitudinal moment 300 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 6": Radial load 2500 N; Circumferential moment 700 Nm; Longitudinal moment 700 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 8": Radial load 4000 N; Circumferential moment 1500 Nm; Longitudinal moment 1500 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 10": Radial load 5000 N; Circumferential moment 2500 Nm; Longitudinal moment 2500 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 12": Radial load 7000 N; Circumferential moment 4000 Nm; Longitudinal moment 4000 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 14": Radial load 9000 N; Circumferential moment 6000 Nm; Longitudinal moment 6000 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 16": Radial load 11000 N; Circumferential moment 8000 Nm; Longitudinal moment 8000 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 18": Radial load 13000 N; Circumferential moment 10000 Nm; Longitudinal moment 10000 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 20": Radial load 15000 N; Circumferential moment 13000 Nm; Longitudinal moment 13000 Nm (From "new_test - Copy - Copy.pdf", Measurements Provided in Document; 10080-1-SS-ME-004, Appendix P).

• Nozzle size 24": Radial load 20000 N; Circumferential moment 18000 Nm;

END OF ENGINEERING SPECIFICATION ANALYSIS